be used; but for the great majority of adults a gap of 90 mm. in the straight edge is sufficient and answers the purpose. A rule of this kind can be quickly made from a piece of thin wood or cardboard. It has been neatly constructed of wood by Bonschur & Holmes, of Philadelphia.

In the great mass of cases the distance of the summit of the cornea in front of the reference line is between 12 and 20 mm., averaging about 16.5 mm. Often there is a difference of 0.5 mm. in the prominence of the two normal eyes. But rarely the difference amounts to 1 mm. unless due to disease, as excessive myopia of the more prominent eye, or orbital changes causing exophthalmos or enophthalmos. The averages indicate that the eye becomes a little more prominent up to the age of sixteen or eighteen years, and that there is a very little sinking in old age; but these changes, and those produced by wasting disease, are probably very much less than might be supposed from casual inspection of the appearance of the orbit. My intention, however, is to discuss these variations of both normal and abnormal eyes at some future time. The present purpose is to put before the profession this simple aid to exact diagnosis.

LOCALIZATION OF FOREIGN BODIES IN THE EYE AND THEIR REMOVAL:

WITH REPORT OF CASES.

By Louis C. Deane, M.D.,
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Localization of foreign bodies in and about the orbit has received a great impetus since the advent of X-ray diagnosis.

Formerly, if by any chance a foreign body, such as a piece of steel, iron, lead, shot, glass, porcelain, or coal, had penetrated into the para-ocular tissues we were satisfied to know whether it was intra-ocular or extra-ocular, and whether, if it were a bullet, it had penetrated into the cerebral cavity. Occasionally we were able to locate it with the ophthalmoscope before the media had lost their transparency through hemorrhage, traumatic cataract, or inflammatory exudation.

If it could not be seen, one of three things had to be done: first, to thrust a magnet blindly into the vitreous, if there were reasons for believing it to be iron or steel; second, to remove the eye, if the inflammatory reaction were profound, or, if not, third, to allow the eye to remain, with the possible danger of sympathetic ophthalmia or in the hope that the foreign body might not be in the globe at all.

The sideroscope (a sensitive magnet hung on a strand of silk, which is deflected when brought near a piece of steel or iron) has a limited value in showing the presence of such a foreign body in the globe or orbital cavity.

The giant magnet of Haab, when brought within the distance of an inch of a piece of steel or iron, lodged in the eye, exerts a marked attractive force often sufficient to draw such a body to the front of the globe if it is not held by inflammatory adhesions or embedded in tissue, where it can be seen and extracted.

These methods of procedure, while they have their value, are often vague and uncertain, and I am convinced that frequently much unnecessary damage is done by the magnet where the exact location of an object is not known. Of course, these instruments are useless in the presence of lead, porcelain, glass, coal, etc.

An X-ray photograph of a foreign body lodged in the orbital region, when taken without the aid of a localizer, is most confusing if an effort is made to determine its position. It is for this reason that numerous attempts have been made to devise exact methods and instruments of precision for the determination of their exact location.

One method might be mentioned, that of Webster Fox, who places an oval band of gold, divided so as to correspond to the principal quadrants of the eye beneath the lid, its shadow acting as the localizer. Two skiagraphs are necessary, one a temporal and the other an occipito-frontal view.

I have tried this method, but must say that in my hands it was of little value. The same cases were subsequently localized by the method described in this article, and the decided and exact character of the results left no doubt in my mind as to its superiority.

The localizer here shown was constructed after the pattern of a machine used by Makenzie Davidson, of London, with the exception of some modifications to enlarge and render more accurate its field of usefulness. Its object is to determine the exact position of foreign bodies in the head with special reference to those lodged in the orbit and eyeball.

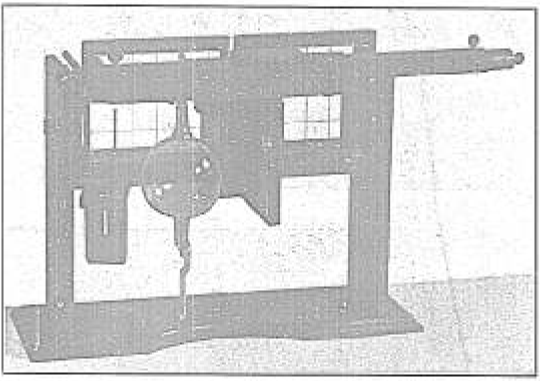
The great importance at times of calculating the exact position of a piece of steel, shot, or bullet, which has penetrated the orbital or cerebral cavity, and the difficulty, or I might say impossibility, of determining its exact location without the aid of a localizer similar to the one I present, prompts me to demonstrate the method whereby these results are arrived at, also to review a few characteristic cases with photographs and projections.

The method of taking two separate radiographs of an object held immovable, from two different points of view and calculating the relative displacement of each in regard to certain fixed markings, to determine its distance from the plate, is not a new one.

This localizer is so constructed that it gives us exact figures to work upon, so that it is possible by the simplest methods of triangulation to arrive at exact conclusions.

The localizer consists of a framework supporting two cross wires at right angles to each other, and has a mechanism to hold a Crooke's tube in a certain position so that the luminous point of rays emanating from the anode is perpendicular to both. The head is then clasped in the machine and held immovable after proper localizers are placed on the face to determine the median line of the head, the vertical meridian of the eye, and the lower limbus of the cornea. The tube is then withdrawn on a line parallel with the horizontal wire a known distance and a radiograph taken. Without removing the head the tube is replaced in its original position and again withdrawn the same distance in the opposite direction, and another radiograph is taken.

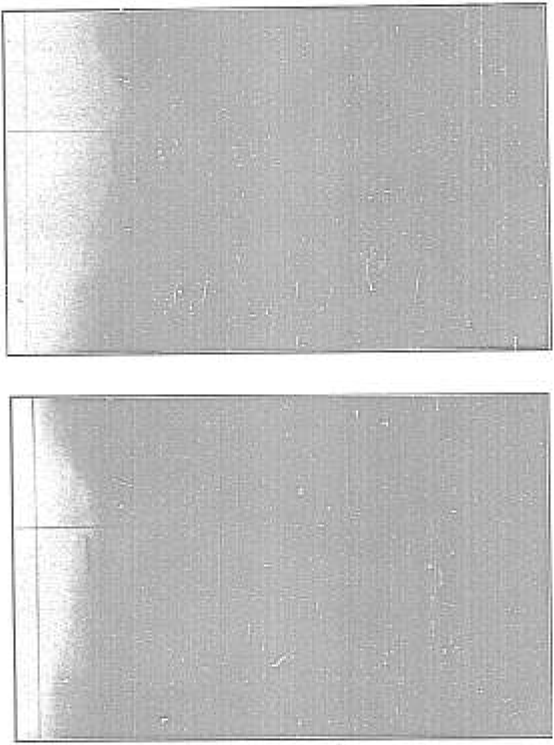
FIG. 1.



The localizer.

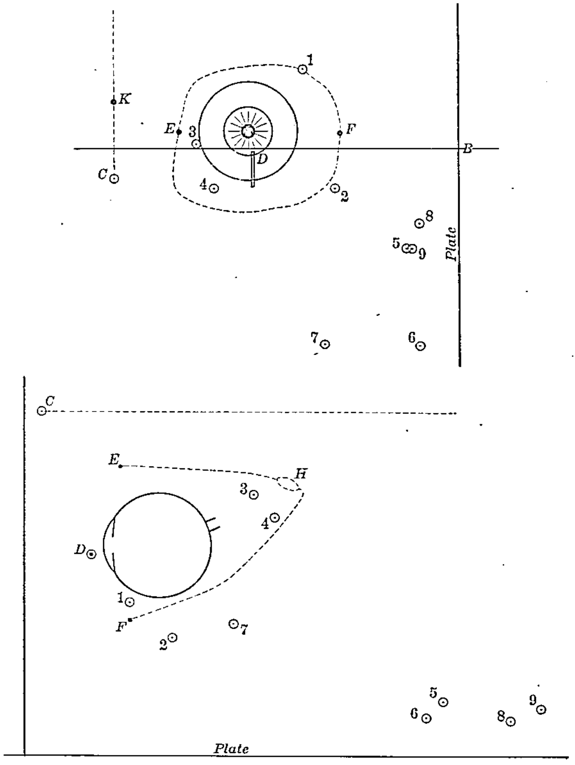
We have now two radiographs with the same object shown on different parts of the plates, the distance between them and their relation to the cross-wires can now be easily determined. The distance of the luminous point on the anode from the plate and the displacement each way from the perpendicular are also known. The distance of the opaque markers, placed upon the face, from the plate has already been measured to verify our results later. With this data at hand one may arrive at conclusions so accurate that the location of the foreign body can be determined within one millimetre. This localizer has a wider range of usefulness than the older instruments in that two-sized plates

FIG. 2.



Case I. X-ray photographs (reduced in size) showing nine shot. The positions of the same shot in their relation to the cross-wires are shown in the two photographs. Their exact location in two planes is seen in Fig. 3.

FIG. 3.



Left Eye

Case I. Vertical and horizontal projections slightly reduced in size from the normal, showing the exact location of the nine shot. *C.* Lower end of nasal bones, which also marks the median line, corresponding to the nasal septum, vomer, perpendicular plate of the ethmoid, centre of optic commissure, etc. *D.* Wire placed on lower lid one millimetre to outer side of vertical meridian of the globe, the upper end of which corresponds with the lower limbus of the cornea. Shot 1, resting on the bone at upper and outer margin of the orbit. Shot 2, on the outer surface of the malar bone. Shot 3, near the apex of the orbit, resting below and to the inner side of the optic nerve, 13 mm. behind the globe. Shot 4, near the apex of the orbit lying below the optic nerve and 16 mm. posterior to the globe. Shots 5, 6, 8, and 9 are superficial, lying beneath the skin in the region of the ear. 5, 8, and 9 are about on a level with the auditory meatus, 5 in front and 8 and 9 immediately behind. No. 6 is near the tip of the mastoid, embedded in the attachment of the sternocleidomastoid muscle. Shot 7 is embedded in the masseter muscle over the ramus of the jaw. The actual distance of the various shots from the wire may be determined by a little descriptive geometry—1.36 mm., 2.28⅓ mm., 3.62⅓ mm., 4.57 mm., 5.13 mm., 6 9 mm., 7.32 mm., 8.8 mm., 9.11 mm. *D*, tip of the wire, 49 mm. *C*, point at lower end of nasal bones, 82 mm. *E* and *F* were determined by actual measurement upon the face; *E* was placed 18 mm. posterior and 13 mm. to the outer side of *C* (the lower ends of the nasal bones). The width of the orbit on a level with the horizontal meridian of the globe is 37 mm., and so *F* was fixed. The distance from *E* to the apex of the orbit was taken as 43 mm can be used, so that a foreign body can be located in any part of the head instead of the immediate region of the orbit.

Case I.—(Figs. 2 and 3.) Robert B., aged eight years, was shot from a distance of seventy feet on February 30, 1901. Case referred by Dr. Overacker. The gun was loaded with No. 7 shot. The shot passed through the skin of the left arm and the left side of the head. The lower lid was penetrated with two shot which entered the globe through the sclera at places corresponding to the wounds in the lid, one at the lower, inner, and anterior quadrant, and the other at the lower, outer, and anterior quadrant of the globe.

I saw the boy for the first time eleven days after the accident. L. V. perception of light only. Tension minus. The ocular conjunctiva was congested without signs of inflammation. Cornea and aqueous clear. Iris discolored, due to blood. The iris showed no signs of inflammation and dilated readily to atropine, none having been used previously. Lens and anterior capsule normal in appearance. With the ophthalmoscope there was no red reflex because of an extensive hemorrhage in the vitreous. The patient had suffered no pain, and there was no pain on pressure.

This case seemed to present some features of special interest. The shot evidently carried no infection with them, as not the slightest trace of inflammatory reaction could be noticed. The signs of their passage into the globe were conclusive, and if they passed out again the removal of the eye was not warranted. If the shot were in the globe the dangers of sympathetic ophthalmia would be greatly increased, and it would be well to consider its enucleation.

By the aid of the localizer I was enabled to show that the two shot, Nos. 3 and 4, had passed through the globe and were lodged in the orbital cavity (Fig. 3), so the eye was left intact and the patient assured that no danger was to be anticipated to the other eye. Had I been in doubt as to their location I would certainly have been justified in enucleating the eye.

Case II.—J. S., aged thirty years, Spanish, referred by Dr. Payne, was shot full in the face with No. 7 bird-shot from a distance of about three hundred feet. The right eye showed that one of the shot penetrated the upper half of the cornea. There was a traumatic cataract with a part of the lens mass in the anterior chamber, and the iris prolapsed and incarcerated in the wound. There was a good deal of conjunctival œdema and a marked orbital cellulitis, with considerable pain. He could see moving objects on the temporal side.

The left eye showed slight orbital cellulitis. Anterior segment of the eye and lens uninjured, but impossible to get any view of the fundus. Absolutely no light perception. Eye tender, but no pain.

Both eyes gradually became softer and passed on to phthisis bulbi.

This case presents no special features, because both eyes were destroyed, but it demonstrated the location of a shot in the right eye, exactly midway between the horizontal and vertical meridians in the lower and inner quadrant, 2 mm. anterior to the equator and resting upon the retina.

CASE III.—(Figs. 4 and 5.) Mr. L., two months ago, while hammering a pipe above his head, felt a sharp shock to his left eye, followed by pain for an hour. He bandaged his eye and continued working with no further inconvenience than sensitiveness to light when he removed the bandage. After four days the bandage was removed. The eye was blind, due to the rapid development of a traumatic cataract.

The case was referred to me by Dr. Payne for localization of a piece of steel or iron lodged somewhere in the globe.

The appearance of the eye at this time showed that a foreign body had passed through the cornea, iris, and lens. The anterior chamber had been evacuated, as there was an attachment between the corneal wound and iris, forming an anterior synechia. This had pulled the anterior layers of the iris forward, leaving the pigment layer adhesive to the anterior capsule of the lens, which was very misleading, giving the impression that it formed part of the foreign body lodged in the iris.

This case had already been placed before the giant magnet, and, while some pain was felt at the time, there was no real evidence that a piece of steel or iron was lodged there, and that method of extraction was abandoned.

The position of the piece of iron was determined by the localizer to be resting on the floor of the eyeball on a line with the vertical meridian and three and a half millimetres posterior to the equator.

An incision through the sclera was made in the immediate region of the point indicated in the diagram, and the foreign body extracted by the magnet, with a small piece of choroid in which it was evidently embedded.

I will say for the localizer that without its use I am certain that by no other method could this foreign body have been extracted.

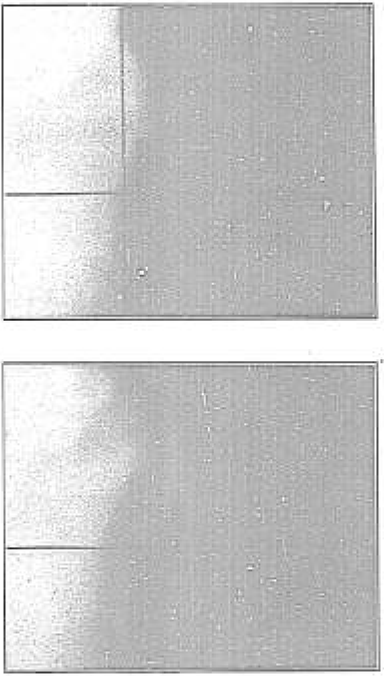
CASE IV.—R. McL., aged thirteen years. Referred by Dr. Mays. Five weeks ago the boy was shot in the face with a load of bird-shot at a distance of forty-five feet. Many shot embedded themselves in his face. One passed through the upper lid and penetrated the eye through the upper ciliary region, evacuating the anterior chamber and prolapsing the iris, which was excised later. A severe uveitis was the result, the vitreous being entirely opaque. The lens, queer to say, is transparent, no traumatic cataract having formed.

The eye is now sensitive, with pericorneal injection, posterior synechia. The patient is suffering from an orbital cellulitis with fever, which has confined him to his bed.

After localization, certain facts were elucidated. The shot that struck the upper lid is apparently not the one that passed through the globe. There are two shot in the orbit. The one that entered the globe passed out again and is lodged six millimetres posterior to it and rests upon the optic nerve. The one that passed through the upper lid is in the upper part of the orbital cavity on a line vertical to the posterior pole.

Nine shot in all were located. The two shot in the orbital cavity had, no doubt, carried in the infection and were causing the cellulitis.

Fig. 4.



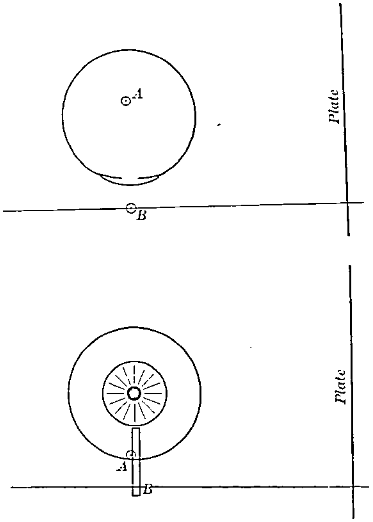
Case III. Shows the presence of a chip of iron lodged in the eye. Note Fig. 5.

Case V.—(Figs. 6 and 7.) P. D., aged forty years, miner. Referred by Dr. Pischel. Four years ago a piece of steel flew in the left eye, but later the patient picked up a piece of steel about as large as a pea on the floor. He could not see for two weeks, then good sight returned. A year later sight became dim again.

Two years ago a cataract was removed, and severe inflammatory reaction followed. After the operation, until three weeks ago, he could see outlines of figures.

At present there is no perception of light. Cornea appears dim from fine, brown exudate on posterior surface. In the upper quadrant of the cornea half a millimetre from the limbus is a horizontal scar, to which the iris is drawn, so that the pupil appears vertically oval. Anterior chamber deep, iris trembling, and tension high. Fundus cannot be seen clearly enough to distinguish an excavation of the disk. Eserine lowers tension.

FIG. 5.



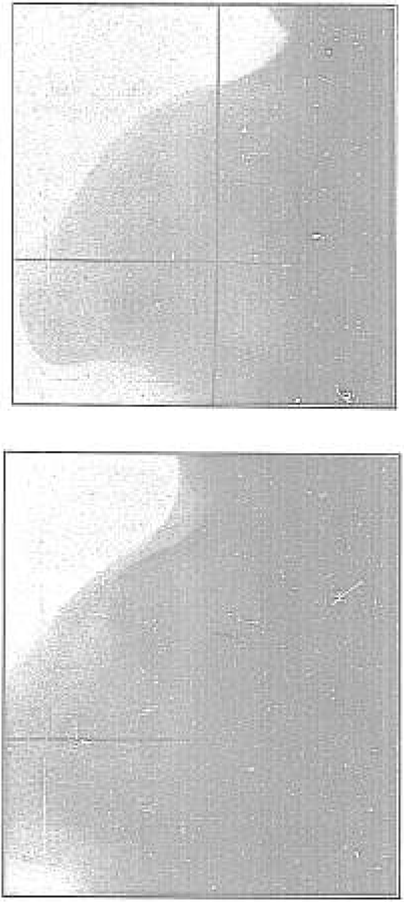
Case III. Horizontal and vertical projections showing location of chip of iron, *A*, as described in text.

The giant magnet caused considerable pain, indicating the presence of iron or steel in the eye, though it could not be dislodged.

After localization the foreign body was seen to be two and a half millimetres above the horizontal meridian, and five millimetres to the inner side and posterior to the limbus, resting upon the retina in the region of the ora serrata. An incision was made directly over this spot and the chip of steel removed by the magnet.

CASE VI.—(Fig. 8.) Referred by Dr. Brady. Seven months ago, while shoeing a horse, the patient's hammer missed the nail and struck the shoe, so that a splinter from the hammer struck him in the left eye.

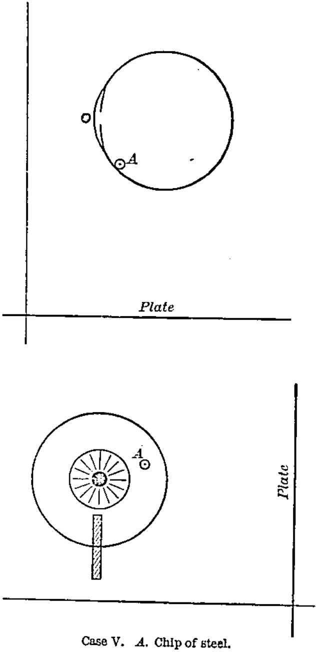
FIG. 6.



Case V. Chip of steel lodged in the eye. Note Fig. 7.

Dr. Brady saw him four hours later, when there were no inflammatory symptoms. At the middle of the inferior quadrant of the cornea, two millimetres from the limbus, was a linear perforation, and immediately behind it was a similar wound in the iris, about two millimetres long. Through the latter was seen the red fundus reflex and the margin of the uninjured lens. The fundus was normal, and the ophthalmoscope and oblique illumination failed to reveal a foreign body. The eye was several times approached to the giant magnet, with negative results. As there was no reliable X-ray apparatus available at the time, Dr. Brady adopted palliative and antiphlogistic measures. Vision was 20/30. A few days later there was a mild iridocyclitis. The iritic congestion was depleted by instilling two drops of adrenalin chloride, 1 : 10,000, every two hours. Vision was now 20/200.

FIG. 7.



Case V. *A*. Chip of steel.

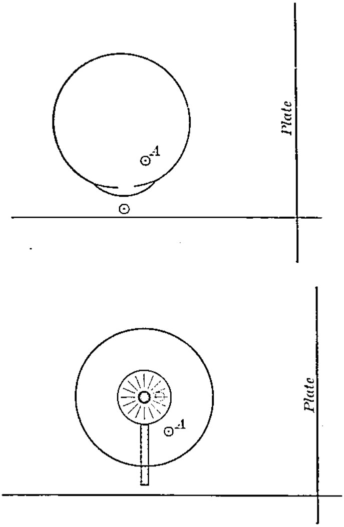
Having seen eyes enucleated and the foreign body found after failure with the magnet, Dr. Brady kept the case under observation.

For his own satisfaction and the patient's security he referred the case for localization, which showed a small foreign body, less than a millimetre in diameter, just behind the ciliary region and about the middle of the lower and inner quadrant.

The vision is now 20/50 plus, and the body being well tolerated, it was thought best to leave it undisturbed.

CASE VII.—(Figs. 9 and 10.) J. H., aged forty-nine years, blacksmith. Injured on May 10, 1902, and referred by Dr. Schloss. Was hammering one sledge upon another when something struck his right eye. Five days afterward there was marked chemosis, no iritis, lens opaque, no increase of tension. At first there was pain in the globe, which subsided before atropine had been used.

FIG. 8.



Case VI. Horizontal and vertical planes. *A*. Location of chip of steel.

A piece of steel four by two millimetres was located two millimetres below the horizontal meridian and nine millimetres posterior and to the outer side of the limbus, resting lightly on the retina.

An incision through the sclera was made immediately over the part indicated in the diagram, and a large piece of steel extracted by the magnet, which verified both our calculations as to its size and position.

Résumé of Cases Showing Some of the Advantages of the Localizer. In Case I. nine shot were localized, but none in the globe, which showed two scleral wounds and a dense hemorrhage of the vitreous. The two shot that entered the globe passed out again. This dispelled the doubt as to their position and avoided possibly a subsequent enucleation.

Case II. shows how a great number of shot can be located on the same radiograph, and proves its accuracy, as the eye was removed and the shot in the globe was shown to be exactly as indicated in the diagram.

Case III. is of interest in that the giant magnet had been used without giving any positive evidence of the presence of a piece of steel, possibly because it was firmly embedded in the choroid and surrounded by organized inflammatory exudate.

An incision was made directly over the foreign body, with no other indication than the diagram, and by the aid of the giant magnet a piece of steel was removed through the sclera with a small mass of choroid and organized exudate.

Case IV. shows the location of nine shot and the undoubted cause of a severe orbital cellulitis.

Case V. A scleral wound was made directly over the foreign body, as shown in the diagram, and a piece of steel extracted.

The giant magnet was used without success, which shows its inability to dislodge a piece of metal when embedded in tissue, as in Case III.

Case VI. is only included among these cases because it demonstrates that very small pieces of metal, less than a millimetre in diameter, show themselves in the radiograph.

Case VII. is where a large piece of steel, four millimetres long by two millimetres broad, was removed by the magnet through a scleral wound.

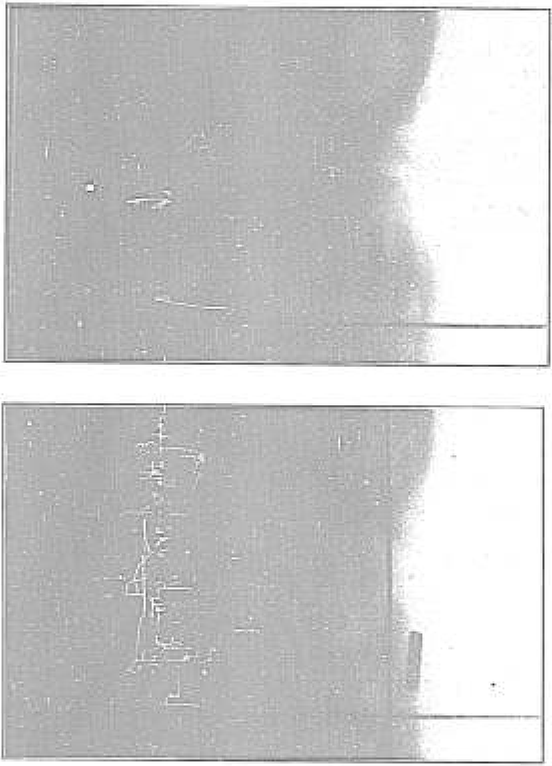
The giant magnet was not previously used upon this case because it was deemed safer to extract it directly through the sclera than drag it through the vitreous, back into the ciliary region, possibly entangling it in the iris.

I do not wish to disparage the use of the giant magnet, for in many cases it has made such work possible, proving itself a most useful adjunct to the localizer.

It must certainly be apparent that if there is any doubt as to the location of the piece of metal, which must be the rule, the localizer should first be resorted to, thereby gaining valuable information, in many cases avoiding a considerable amount of unnecessary traumatism, and greatly simplifying its extraction.

The number of cases where the foreign substance can be seen are very few. Haab reports that in 165 cases 80 had traumatic cataract, and, with hemorrhage and inflammatory exudation, it places this class of cases greatly in the minimum.

Fig. 9.



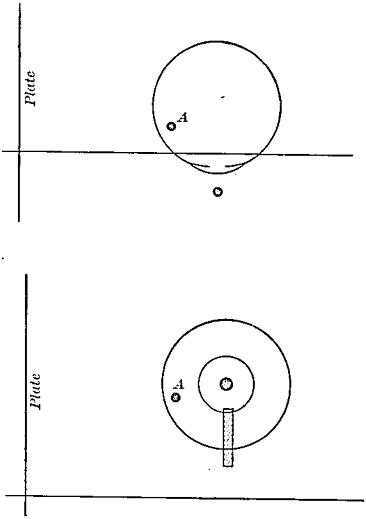
Case VII. The photographs show a piece of steel 4 mm. by 2 mm. in the orbital region. For its location, note Fig. 10 and the text.

To show how easily one can be deceived by appearances, in Case III. a bit of iris pigment could not be distinguished from a piece of iron by the closest observation. The localizer proved it to be pigment and showed a piece of metal in another place from where it was subsequently removed through a scleral wound, made directly over its location.

Some objection has been offered to removing foreign bodies through scleral wounds on account of the danger of detachment of the retina.

As to my own experience, in the past two years, with scleral wounds, I am pleased with the simplicity of this method, and in 14 cases thus treated I have not observed a subsequent detachment.

FIG. 10.



Case VII. *A*. Piece of steel. For a description of its location, note the text.

I have seen one case, previous to the present method of extraction, where a detachment of the retina followed the usual extraction of a piece of steel by the Haab magnet. The magnet was not used for three weeks after the injury, and, I believe, in drawing the steel forward it detached the retina to which it was adherent.

I am pleased to see that there are some who concur with me (Sweet, Holt, etc.) in the advisability of scleral extractions where the position of the foreign substance is known and near or posterior to the ora serrata.

It must be said of many advocates of the giant magnet that they begin their work of extraction without exact knowledge of the position or size of the substance they are about to remove. To these the scleral wound is only a return to the old method of opening the sclera and inserting the tip of a small magnet blindly into the vitreous. With the localizer and giant magnet the latter need never be done, and there can be no question that much damage is thus avoided.

THE LYMPHATIC SYSTEM AND THE TONSILS.[1]

By Henry L. Swain, M.D.,
of New Haven, Conn.,
Professor of Diseases of the Ear and Throat, Yale University; Fellow of the American Laryngological Association, etc.

Permit me in presenting to your attention this evening this subject, with its rather uninviting title, to adopt the methods of our brethren who dispense the consolations of religion, and to take the history of a case as a text or point of departure, suggesting the lines of thought which will be followed in these remarks. The case is in itself rare enough to excite our interest, and demonstrates the reverse picture of what we have clinically long observed, viz., the influence of the tonsils on the general lymphatic system.

Mr. P., aged sixty-three years, consulted me in June, 1899, with the statement that he had had a bad throat for the last six months, having felt that he was having a gradual filling up of the throat without pain or soreness. He had had no violent cold or fever. His throat sometimes felt so full that he could scarcely swallow, and he often experienced difficulty in breathing, especially on lying down.

Examination of the physical condition developed that he was a fairly well-nourished man of his age, and apparently possessed a fair amount of physical vigor. There was no evidence in the general physical examination of anything, except what was referable to his throat, other than a complete alopecia, for which he wore a wig. The outside of his neck appeared to be somewhat thicker than seemed reasonable in a man of his general build, and the lymphatic nodes in the neck back of the angle of the jaw were diffusely but not greatly enlarged. Otherwise the glands of the body were palpable, but not increased in size. In the erect position he was able to breathe fairly well through his nose, or as easily through his nose as he did with his mouth open. Examination of the throat developed the condition which is evident in the drawing which I will pass around. Both faucial

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[1] Read before the Section on Otology and Laryngology of the College of Physicians of Philadelphia, March 18, 1903.